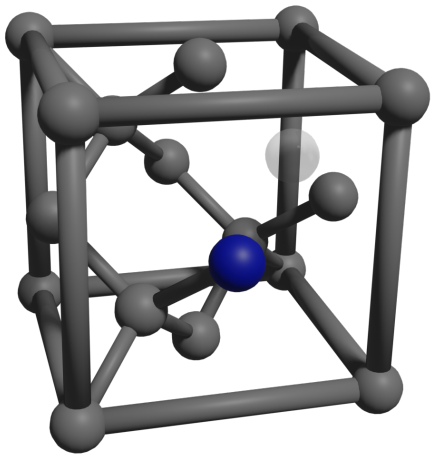
Summer 2024

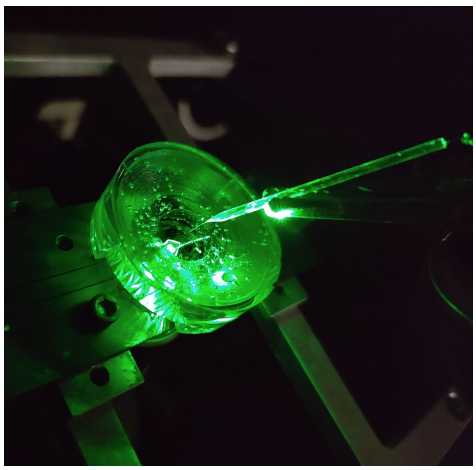
Optics & Photonics Group Lunchtime Seminar Series

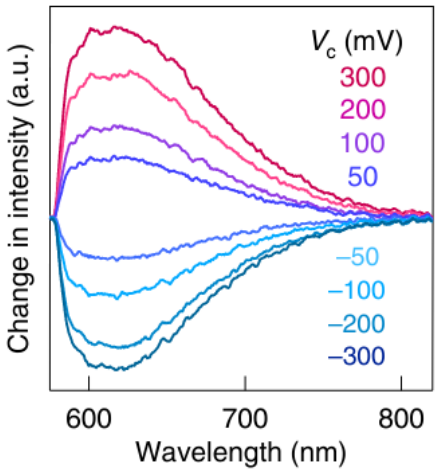
University of Nottingham

Voltage sensing using colour centres in diamond

Charlie Pattinson
University of Melbourne







15:00 Friday 19 July 2024

Life Sciences - B3

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Charlie Pattinson

Voltage sensing using colour centres in diamond

Recording electrical signalling in biology is essential for discerning how our brain creates thoughts to how our mouths, hands and bodies express them. The continued study of this electrical activity is not only important for understanding how healthy processes operate but also in realising how these mechanisms fail and lead to disease. Neurological disease is a prevalent example, where existing techniques such as multi-electrode arrays and fluorescent dyes, have already shown features in their onset, development, and conclusion. However, these techniques work on spatial and temporal resolutions not necessarily matched to the scales relevant for neurological diseases, with development happening at single neuronal levels and occurring over days to weeks. A diamond voltage imaging device has recently demonstrated its ability to fill this niche, providing label-free optical imaging with stability over months. In this presentation I will run through the working principles of this novel voltage imaging sensor and the further developments I have been working on in my first year of my PhD. Finally, I'll run through some of the work I plan to do while here in Nottingham using voltage sensitive nanodiamonds.

Charlie Pattinson is a second year PhD Student studying in the department of physical biosciences at the University of Melbourne. Charlie works in understanding ultra-near-surface defects in diamond for optically sensing voltages from specimens in solution. In his master's Charlie studied electrochemical methods for tuning surface oxidation states of diamond for achieving maximal voltage sensitivity, and for this work received the Klein Prize in Experimental Physics. Now, as a part of the ARC centre of excellence for Quantum Biotechnology and as a scholarship recipient from the Graeme Clark Institute, Charlie is involved with developing and implementing these diamond voltage imaging microscopes for biomedical applications.

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All are welcome

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